

# Distributed Generation Improvements in Industrial Applications



## Peer Review

December 2-4, 2003  
Washington, DC



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(formerly the Industrial Center)  
[www.escenter.org](http://www.escenter.org)

# Project Goal

....accelerate the acceptance of *replicable* distributed generation (DG) technologies and to document the use of *innovative heat recovery* applications at *industrial* and institutional sites

# Project Statistics

- **Contract competitively awarded to the Energy Solutions Center in response to RFP No. 340002748**
  - **Project awarded in December 2000**
    - **Phase I, Market Assessment completed in FY 2001:**
    - **Phase II, Industrial CHP Evaluations at customer sites initiated in August of 2001**
- DOE Project Manager: Patti Garland, ORNL**  
**DOE Program Manager: Merrill Smith, DER**
- **Cost Share: Energy Solutions Center team 85% and DOE 15%**



# **Joint Program Between DER and a Consortium of Energy Utilities in Support of the Strategic Plan**

- **Our market assessment projects an 11 GW increase in the industrial sector for CHP projects below 1 MW**
- **The Industrial CHP evaluations and “Applications Guide” are designed to help customers select more efficient, more reliable, and lower cost systems**

*use the waste heat – minimize site engineering – standardize designs*



# Project Team

- **Energy Solutions Center and DG Consortium**
  - Provides project management, co-funding, market, and technology support
- **Subcontractors provide market assessment and site support**
  - Resource Dynamics Corp. and CSGI, Inc.: market assessment
  - EEA Inc. and Exergy Partners: site support
- **Host sites and host utilities**
  - Provide primary funding and assist with data collection effort

# DG Consortium of Energy Utilities

**Dominion Energy**

**NiSource Inc.**

**DTE Energy/Michcon**

**NW Natural**

**Enbridge Gas Distribution**

**Southern Natural Gas**

**Exelon Corp. (PECO )**

**Southern California Gas Co.**

**KeySpan Energy**

**TXU/Oncor Group**

**National Fuel Gas**

**We-Energies**

**Nicor Inc.**

**Yankee Gas Services Co.**



# Industrial CHP Evaluations

Using the market assessment as a guide  
DOE and ESC worked together to screen and  
select replicable industrial CHP sites  
(two in FY 2002 and one in FY 2003):

## Host Site

C & F Packing

## Industry

Food Processing

21,000 plants

## Host Utility

Nicor

Faith Plating

Metal Plating

700 plants

SoCal Gas

Higgins Brick

Brick Manufacturing

720 plants

SoCal Gas



# Task Definition

- **Complete host site agreement**
- **Design and install data acquisition system**
- **Collect performance data for twelve months**
- **Analyze data and prepare case history**
- **Update an Industrial Application Guide**



## C & F Packing



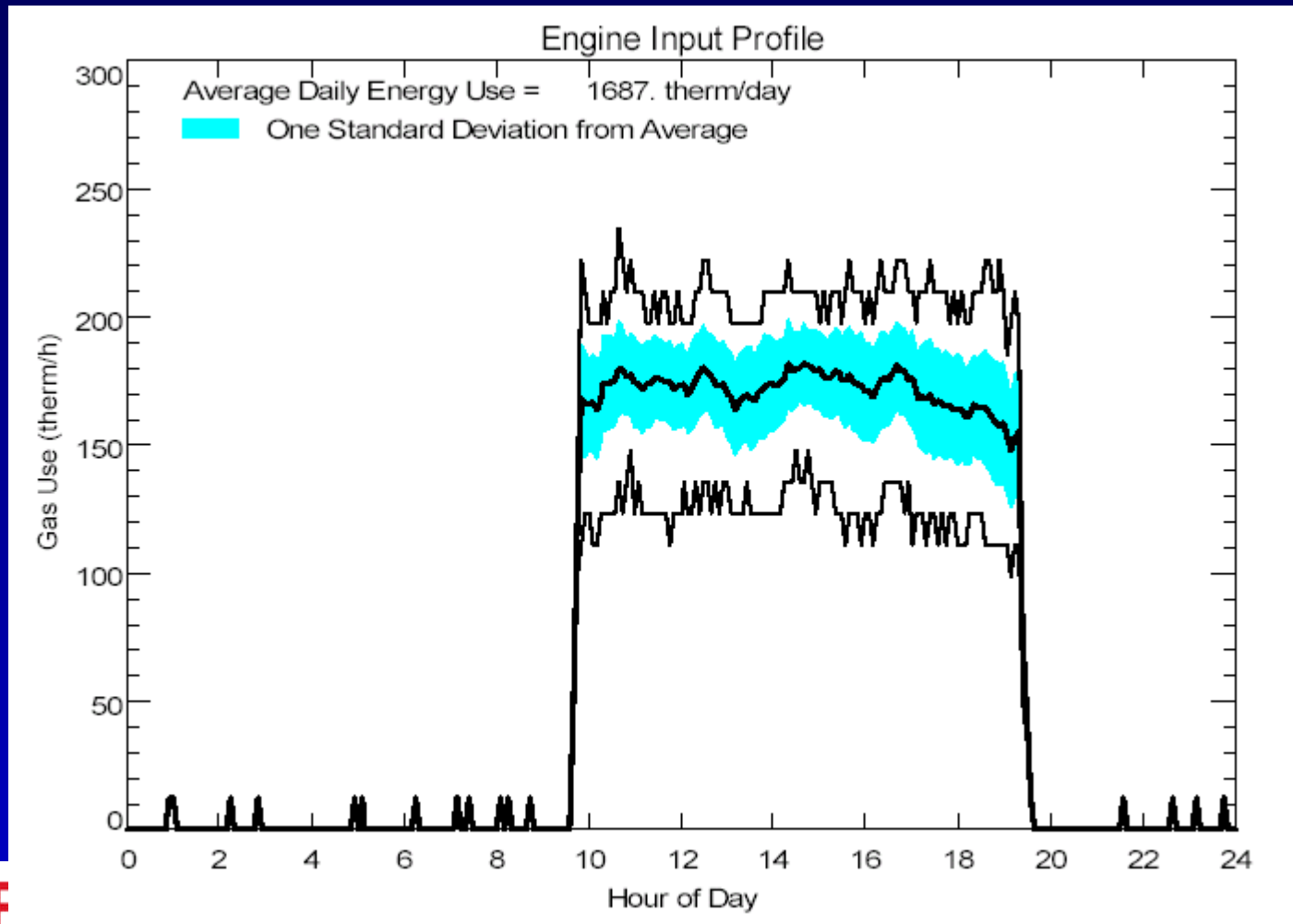
## **Food Processing**

<b>Site:</b>	C & F Packing, Lake Villa, IL
<b>Product:</b>	Processed meat and sausages
<b>Cons. Utility:</b>	Nicor Gas
<b>Power Gen.:</b>	Two 1125 kW Waukesha Engines
<b>Heat Rec.:</b>	Boiler feed-water preheating
<b>Operation:</b>	9 am to 6 pm five days a week peaking operation
<b>Status:</b>	New meat processing facility commissioned 5 -02
<b>Comments:</b>	Rate response driven operation; steam used in direct contact steamers; potential to expand heat utilization. Twelve month performance evaluation completed. Payback: 5-12 years. Outage cost: \$125,000 Case history available

# C&F Installation

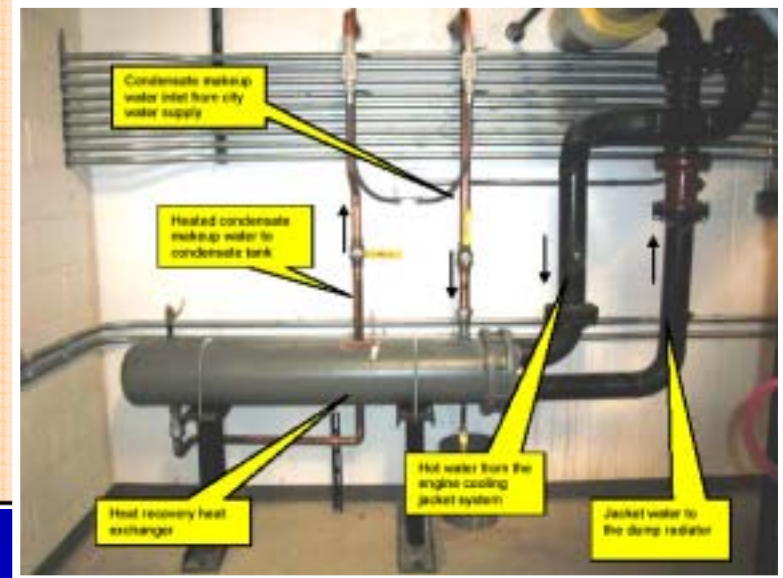
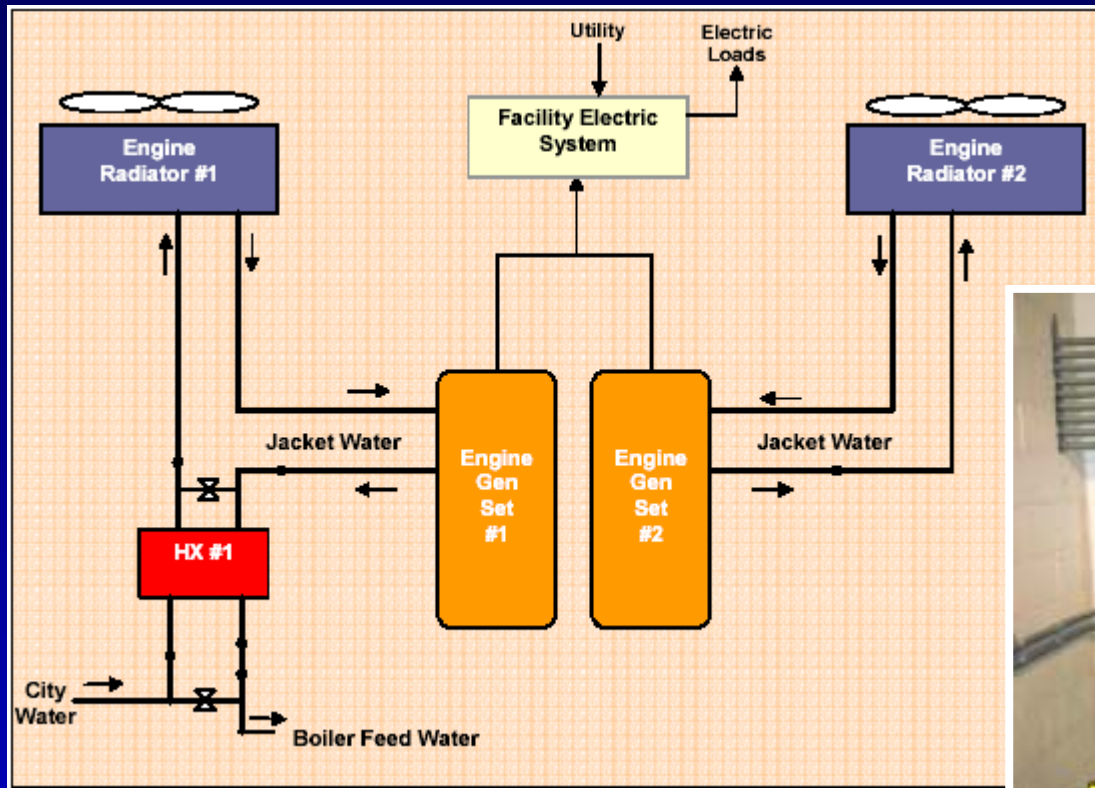


# Peak Shaving Operation Preferred Under ComEd Rates





# Peaking Operation Limits Waste Heat Recovery



# Large Steam and Hot Water Load





## **Metal Plating**

<b>Site:</b>	Faith Plating Co. in Los Angeles, CA
<b>Product:</b>	Chrome plating shop
<b>Cons. Utility:</b>	Southern California Gas Company
<b>Power Gen.:</b>	Four 30 kW Capstone micro-turbines
<b>Heat Rec.:</b>	Hot water for plating tank heating
<b>Operation:</b>	base loaded
<b>Status:</b>	Units placed in operation during fourth quarter 2001
<b>Comments:</b>	Customer is also using waste heat from the Unifin heater for sludge drying for maximum heat recovery – other plating companies interested Payback: 4 years with one-third capital cost subsidy





# Faith Plating Installation



# Faith Plating Turbine Exhaust Used in Sludge Drying



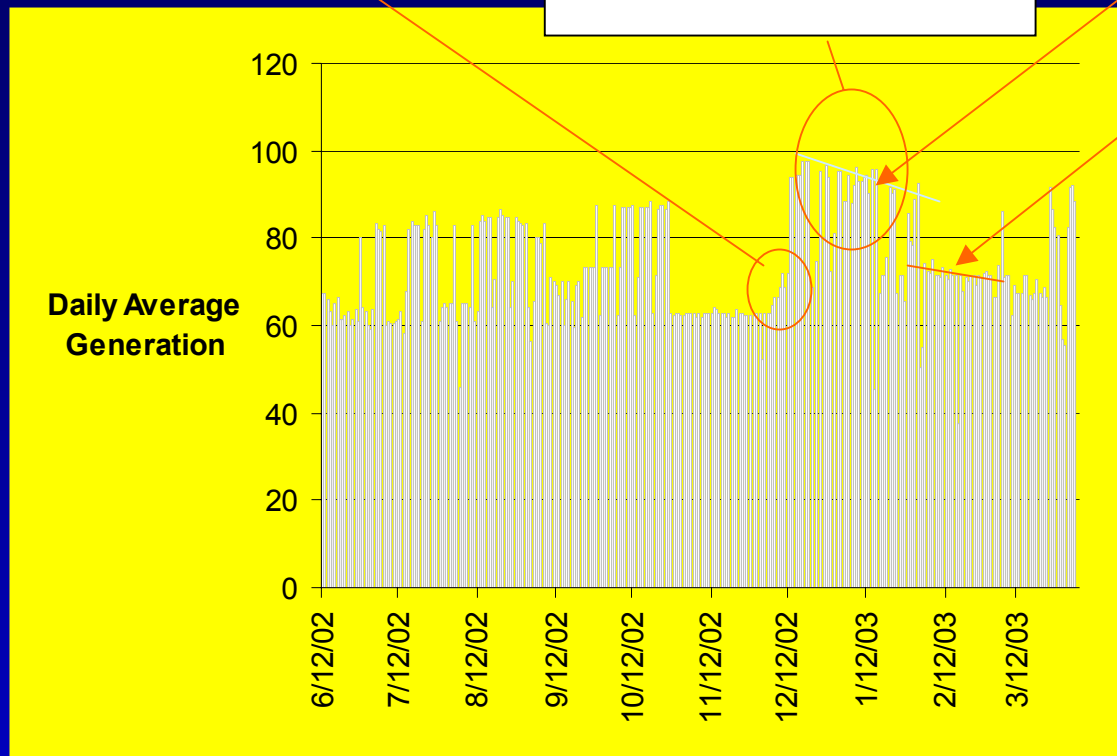
*CHP  
Efficiency:  
74 %*

# Microturbine Performance

EEA advises plant to fully load the turbines

With all four turbines operating, power generation approaches 100 kW.

One Turbine Down



# Higgins Brick



## **Brick Factory**

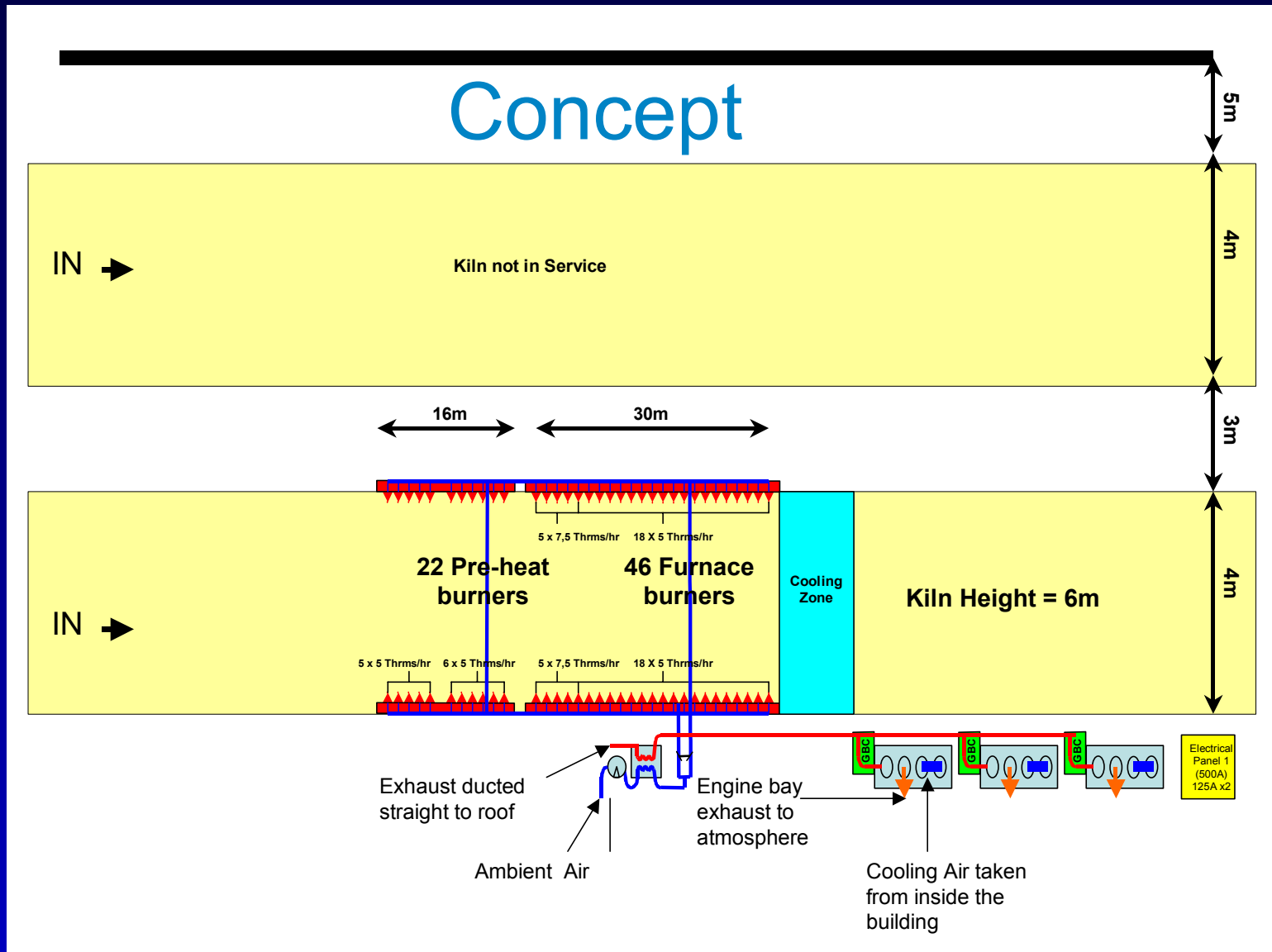
<b>Site:</b>	Higgins Brick Co., Chino Hills, CA
<b>Product:</b>	Brick products
<b>Cons. Utility:</b>	SoCal Gas
<b>Power Gen.:</b>	Three 80 kW Bowman micro-turbines
<b>Heat Rec.:</b>	Indirect heat exchange to pre-heat kiln comb. air
<b>Operation:</b>	Three base loaded turbines 24/7
<b>Status:</b>	Micro-turbines shipped; Installation in progress
<b>Comments:</b>	Demonstrates waste heat recovery for process heating. Operation scheduled to begin in late fall 03 Bowman will provide energy services



# Higgins Brick Background

- **Founded in 1927**
- **Produced 4 billion bricks in its 76-year history**
- **Located in Chino Hills, CA**
- **Total capacity is 60 million bricks annually**
- **Remains family enterprise to this day, directed by Ronald Higgins, Sr., as well as several fourth generation family members**
- **Manufactured some of the largest brick projects ever undertaken in California - Including:**
  - **Market Street in San Francisco**
  - **Parkloft in San Diego**

# CHP Performance Evaluation: Higgins



# 2003 DOE Program Activity Plan & Milestones



1. **Completed data analyses and case histories for the C&F Packing and Faith Plating sites.**
2. **Initiated new data evaluation effort at Higgins Brick and completed**
  - host site agreement
  - site assessment
  - heat recovery analysis
  - data plan and web interface report
3. **Completed draft “DG Application Guide”**

**2004 Plan: Complete Higgins Performance  
Evaluation and Screen New Sites**





## DG Applications Guide

### 1. **Focus:** Industrial Installations

### 2. **Content:**

Chapter 1 Introduction

Chapter 2 Combined Heat and Power Basics

Chapter 3 CHP Market

Chapter 4 CHP Technologies

Chapter 5 Industrial Processes and Applications to  
Integrate CHP Systems

Chapter 6 Site Assessments, Design, and Installation Tips

Chapter 7 Evaluating Economic Viability

Chapter 8 Case Histories

**Currently in Review**



# DG Applications Guide

DG Consortium funds content on:

Gas Industry Overview

Utility Rates

Manufacturers (Product Information)\*

Interconnection\*

Emissions\*

Selection Guide

**\*ACTIVE**

[www.PowerOnsite.org](http://www.PowerOnsite.org)



# Market Assessment Identifies Barriers

- ✓ Product performance and availability\*
- ✓ Lack of off-the-shelf integrated systems\*
- ✓ Presence of a supporting market infrastructure\*
- ✓ Awareness, information, and education of end users\*
- ✓ **Demonstration of successful case studies\*\***
- ✓ Environmental regulations
- ✓ Planning, zoning, and codes
- ✓ Tax treatment
- ✓ Utility rate structures\*
- ✓ Interconnection standards\*

\* Addressed by the ESC DG Consortium

\*\* Key element of current projects

# What We Have Learned

- ✓ There is a need for developing CHP Engineers...there is a knowledge gap between power engineers and process engineers

**Solution:** **Regional CHP Application Centers**  
**Application Guides**  
**CHP Factoids from Manufacturers**

- ✓ There is a need for improved controls for managing CHP systems.

**Solution:** **Connected Energy, Encorp, etc.**  
**American DG, BluePoint Energy,**  
**US Power etc.**

# Host Site Testimonial:

“.... how much we appreciated working with your organization relating to the case study work you did for our Co-generation system. ....our Chief Engineer, was very pleased with both the information gathered and the cooperation he experienced when working with your personnel. Now that the final report is out we are happy with the way you handled the publicity as well as the information contained within. **I hope it can help other companies make a more educated decision when considering generation. It certainly has been the right one for us....** Although I was a little apprehensive at first, I would like to thank you for choosing us as a participant in this program.”

# For Additional Information Contact:

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# Appendix

## Energy Solutions Center and Consortium Statistics

# Energy Solutions Center

**Provides commercialization & market development support for natural gas technologies in the industrial, commercial and residential sector**

- Established in 1991 (spin-off from AGA)
- 501(c) 6 trade association of 74 energy utilities and associated companies
- Located in Washington, DC
- Executive Director: David Weiss
- **Consortium approach** to products and services

[www.escenter.org](http://www.escenter.org)





# DG Consortium Membership Statistics

- **Members:** Fourteen utilities
- **Product Champions:** Rob Eck, National Fuel  
Henry Mak, SoCal Gas
- **Technology Lead:** Bob Fegan, DTE Energy  
*Interconnect Standards*
- **Center Coordinator:** Richard Biljetina

# Industrial CHP Support

- DOE Office of DER & ESC provide
  - CHP integration and design engineering
  - data acquisition for 6-12 months
  - case studies and market transformation tools
- DOE Office of DER & ESC
  - obtain data rights
  - make public the results of DG projects
- Host site finances, owns, operates and maintains total system